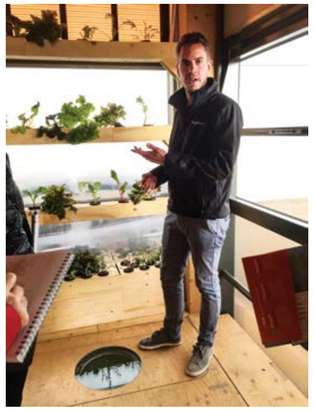
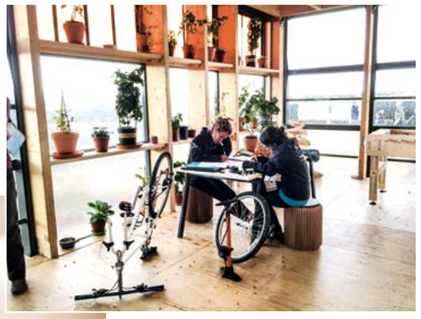
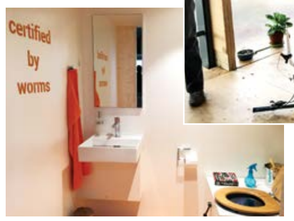






Above and right: the Swiss team's NeighborHub structure will return to Fribourg where it will become a co-working space attached to the blueFACTORY, a research and development center for the built environment of the future. The walls are all "productive" supporting solar panels, plants, aquaponics and solar dryers. A "dry" toilet uses worms to treat and recycle waste. Spaces are multi-functional allowing for conference rooms, dining, bicycle repair and sleeping. Team members said local residents like the look of the 1,800-square foot structure even though it looks nothing like a Swiss chalet.

(Continued from page 19) region, designed a house with vertical hydroponic planters watered by rain that could grow food all year-round.

Team Daytona Beach lost 10 days of crucial construction time when Hurricane Irma hit Florida. And the Netherlands team had to scramble when Hurricane Harvey delayed the shipment of their structure through the Port of Houston.

During the competition itself, Hurricane Maria's devastation of Puerto Rico and the raging wildfires in northern California seemed to emphasize the importance of withstanding the greater weather extremes associated with climate change. And that's not to mention the wild swings Colorado weather visited upon the Solar Village in early October. In a post-event press release, DOE referred to the heat, cold, wind, sun, rain, fog, snow and mud as the 11th contest. The Missouri team's "Crete" house earned extra points when the thermal mass of their concrete structure radiated enough heat through a cold night to allow interior comfort without use of a heating system, said juror Bill Rectanus, vice president of operations with Thrive Home Builders.

Solar Decathlon Contests

The "student athletes" competed in 10 categories: architecture, market potential, engineering, communications, innovation, water conservation, health and comfort, appliances, home life and energy. Each category was worth a maximum of 100 points, for a potential competition total of 1,000 points. The four top-scoring teams were the Swiss Team (872 points), the University of Maryland (822), the UC Berkeley/University of Denver team (807) and Missouri University of Science and Technology (758).

Teams could earn points three ways:

Task Completion—Teams complete tasks that simulate modern living. They perform household chores such as cooking and doing laundry. They host dinner parties and game nights for fellow competitors. And, they are required to log miles driving an electric vehicle charged by the house's solar electric system.

Monitored Performance—Team houses and appliances perform to specified criteria, such as maintaining indoor temperature and humidity within a tight range, ensuring refrigerators maintain appropriate temperatures, and carefully controlling the flow of electricity between the house and the utility.

Jury Evaluation—Jurors who are experts in fields such as architecture, engineering, homebuilding, water use and reuse, and communications, award points for features that cannot be measured, such as aesthetics, design inspiration and innovation.

Juror Bill Rectanus, whose company Thrive Home Builders was one of the sponsors, said, "I'd do it again in the blink of an eye. The students were very impressive, really inspirational."

Team Netherlands, with the house they named "Selficient," won the People's Choice award. Middle school students who visited the solar village selected Northwestern's "Enable" house for the Students' Super Awesome House Award.

The competition returns to Denver in three years. If you can't wait that long to further explore the students' ideas, the DOE website, http://solardecathlon.gov/, contains descriptions of each team's submittal. DOE also issued a report in October detailing the design innovations presented at the seven prior decathlon competitions. It can be accessed at www.nrel.gov/publications ("Insights on Technology Innovation – A Review of the U.S. Department of Energy Solar Decathlon Competition Entries 2002-2015"). The list of all 11 teams and their scores is on the *Front Porch* website at FrontPorchNE.com.

Left: The Las Vegas house had radiant floor heat using water heated by the solar system shown at left. Half of the blue hot water tank below holds water for the floor and a separate half is for household use. Below: A Tesla Powerwall for battery storage is on the outside of the house behind a garage-style door.

Above: The Netherlands team designed the Interior plumbing to make use of gray water. Their "upflow shower" treats, recycles and reheats shower water in a closed loop.

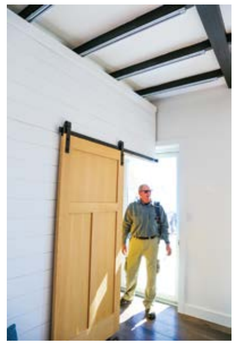
Above: Energy display and control systems allow homeowners to make time-of-use decisions to reduce energy costs. Above is the UC Davis team's water usage displayed in the bathroom mirror.

Below: The Alabama team built a secure closet in their "surviv(AL)" house that would be a safe shelter in a tornado up to 250 mph, even if the rest of the house was destroyed.

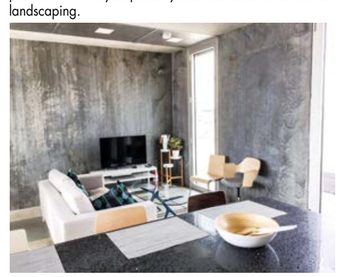
Innovations at the Solar Decathlon

Left: Many of the homes had improved wall insulation through better wall construction techniques and materials such as rock wool, foam sandwiched between thin concrete panels, and the sheep's wool used in the DU/Berkeley house.

Below: Wall panels in the DU/Berkeley house quickly and easily glide on a ceiling track—making the adjoining living room and bedroom/study spaces bigger or smaller as current use dictates.



Below and right: The Washington University - St. Louis "Crete" house was built of pre-cast insulated panels of ductil concrete, a super strong material used in bridge abutments. The gutters of the Crete house collect rainwater and serve as vertical planters in their hydroponic system that doubles as exterior landscaping.



Below: Modular construction techniques allow some housing elements to be pre-fabricated, enabling "cleaner, easier, faster" on-site construction, such as this electrical wiring at the Netherlands house.